

تقويم تعرض الإنسان لمجالات الترددات الراديوية لأجهزة الاتصالات اللاسلكية

Assessment of Human Exposure to Radio Frequency (RF) Fields for Wireless Communications



Dr. Ibrahim Elshafiey

Assoc. Prof., Electrical Engineering Department, King Saud University

Chair of the Standardization Technical Committee of Human Safety of Non-Ionizing Radiation, Saudi Arabian Standards Organization

Mobile communication technology has grown rapidly during last decade. The widespread of use of this technology initiated public concerns about RF radiation effects on health. The complexity of interaction between biological tissues and RF fields, led to difficulties for researchers working into this discipline to obtain robust and replicable results. This is why it is still not easy to draw clear conclusions about the nature of these interactions, in spite of the enormous volume of scientific work on the subject.

These concerns initiated an interest at the department of electrical engineering at King Saud University to set a facility for investigating the issue of human exposure to RF fields. With support obtained from King Abdulaziz City for Science and Technology KACST, a system has been installed with main components of a robot, a phantom, human simulating liquids and measurement probes. A six-degrees-of-freedom robot is used along with SAM phantom of the human head. The phantom is filled with brain simulating liquids prepared to match the electromagnetic parameters of the human brain tissues at the frequencies of operation. Specialized probes are employed to map the specific absorption rate (SAR) values at different locations in the brain phantom, particularly close to the hot spot.

Computational models are also developed to simulate these highly heterogeneous structures and conduct electromagnetic as well as thermal analysis. The models accounts for RF fields and their energy deposition, in addition to the metabolic heat generation and the cooling associated with the blood circulation. The experimental as well as the modeling capabilities are currently used in research efforts related to assessment of SAR values of commercial cell phones, optimization of handheld terminal design, identification of biological tissue effects on antennas, material characterization, ultra-wide band biomedical imaging system, and SAR of MRI systems. Success in these efforts should get the research community of King Saud University to play a considerable role in maximizing the benefits of RF fields, and minimizing their effects on human users.

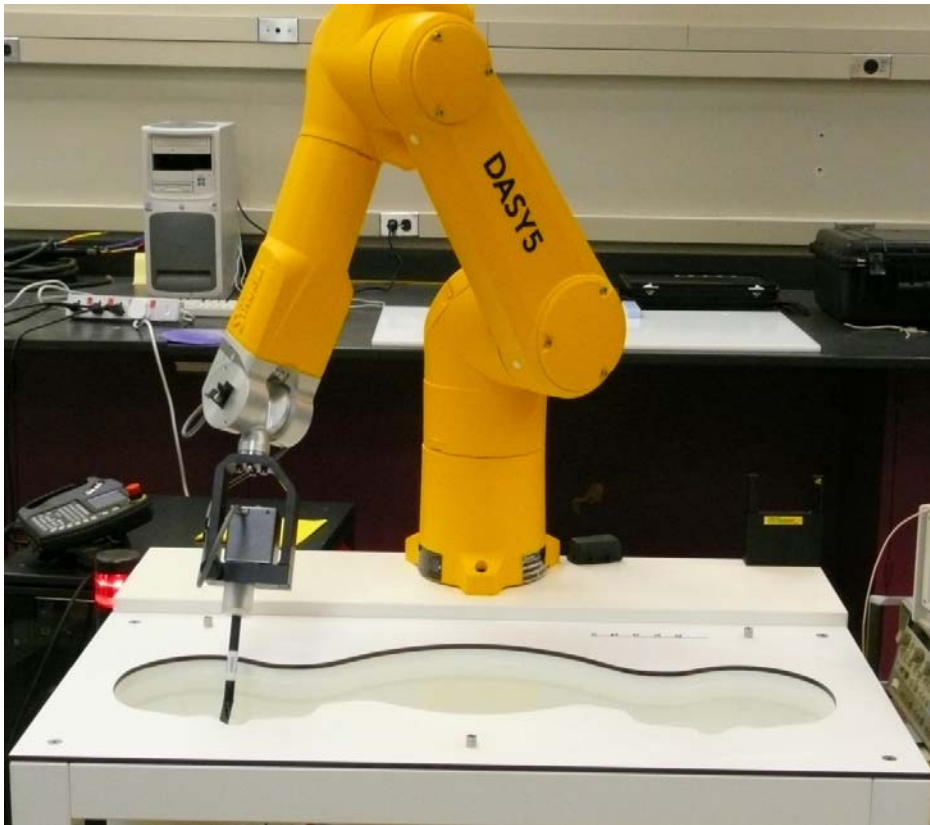


Figure 1. The robot along with the phantom filled with human brain simulating liquid at 1800 MHz.